Page 3, lines 32 – Page 4, line 9:

The present invention has been devised to solve those problems in the related art and it is an object of the present invention to provide a reactor structural member and a method of reducing corrosion of the reactor structural member capable of reducing the respective amounts of hydrogen and noble metal to be injected into the reactor water to prevent stress-corrosion cracking, of reducing the transfer of radioactivity to the turbine system, of reducing excess hydrogen in the off-gas system, of reducing the amount of a noble metal adhering to the surface of the fuel material to the least necessary extent, and of reducing the corrosion potential of members of the primary system of a nuclear reactor by suppressing the production of loose iron particles on the surface of the fuel without promoting the oxidation and hydrogenation of the fuel material.

Page 4, line 28 – page 5, line 6:

The photocatalytic substance is a substance having a property of an n-type semiconductor, such as any one of compounds including TiO_2, ZrO_2, PbO, $BaTiO_3$, Bi_2O_3, ZnO, WO_3, $SrTiO_3$, Fe_2O_3, $FeTiO_3$, $KTaO_3$, $MnTiO_3$, and SnO_2. These compounds are stable in a high-temperature, high-pressure, radioactive environment, and do not significantly increase the migration of radioactivity to the turbine system, and do not significantly promote the oxidation and hydrogenation of the fuel material. The corrosion potential of the structural members of the primary system of a nuclear reactor can be controlled by attaching any one of those compounds to the structural members of the nuclear reactor or by forming a film of the compound on the surface of the structural members of the nuclear reactor. Preferably water quality is controlled. The radioactivity of the fuel material and the activated compound is low.

Page 5, lines 24-30:

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The photocatalytic substance, the photocatalyst forming substance, the photocatalytic substance combined with a noble metal, such as Pt, or the photocatalyst forming substance combined with a noble metal, such as Pt, is attached to the surface of a structural member of a nuclear reactor. A film of the substance may be formed on the surface of a structural member of a nuclear reactor.

Page 13, lines 18-30:

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When an Fe-base alloy on which an inner layer of a p-type semiconductor and an outer layer of an n-type semiconductor are formed, such as a stainless steel, is used, the n-type semiconductor of an oxide forming the outer layer is made unstable to expose the p-type semiconductor of an oxide in a contact interface by increasing the hydrogen concentration of the reactor water, or the n-type semiconductor of an oxide forming the outer layer can be removed by decontamination. The corrosion potential of the member can be further lowered by bringing the p-type semiconductor of an oxide, and an n-type semiconductor, such as TiO_2, i.e., a powerful photocatalytic substance, into contact.

On page 16, lines 6-17:

A5

Fig. 3 is a graph showing the variation with time of the corrosion potential of a structural member of a stainless steel (SUS304, JIS) coated with a TiO_2 film when exposed to ultraviolet rays for an amount of hydrogen injected into reactor water. The corrosion potential of the structural member of SUS304 decreases when the structural member is irradiated with ultraviolet rays under a condition where hydrogen is not injected into the reactor water. However, when the structural member is irradiated with ultraviolet rays under a condition where

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hydrogen is injected into the reactor water, the corrosion potential of the structural member of SUS304 decreases more effectively.

Page 17, line 36 – page 18, line 24:

Fig. 6 is a graph showing the variation of the corrosion potential of a structural member of a stainless steel (SUS304, JIS) coated with a semiconductor film when the structural member is exposed to ultraviolet rays. An anode current produced by the photoelectrochemical reaction of a semiconductor must be higher than a cathode limiting current density, i.e., the density of a cathode current produced by the oxidizing components, such as oxygen and hydrogen peroxide, of the reactor water to reduce the corrosion potential. The anode current produced by the photoelectrochemical reaction of the semiconductor is dependent on the intensity of light and the mass of deposit per unit area of the semiconductor composition. The cathode current is dependent on the concentration of the oxidizing materials, such as oxygen and hydrogen peroxide, contained in the reactor water. For example, it is estimated that oxygen concentration and hydrogen peroxide concentration in a bottom part of the nuclear reactor are 200 ppb. A limiting current density of the cathode current resulting from the oxidizing substances calculated taking into account the amount of the oxidizing substances and flow conditions in the bottom part of the nuclear reactor is about $18A/m^2$. To reduce corrosion potential, the anode current must be higher than about $18A/m^2$. When a current of $18A/m^2$ or higher is produced by the photoelectrochemical reaction, corrosion potential decreases.

A6

Page 22, lines 6-21:

Fig. 16 is a typical view of assistance in explaining, when a member has a metal base 2 and an n-type semiconductor film 22, which is not a photocatalyst film, a process of forming a p-type semiconductor film 21 on the metal base 2. When the n-type semiconductor film 22 is removed by chemical or electrolytic

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decontamination, the p-type semiconductor film 21 grows on the metal base 2 by a chemical reaction. When the n-type semiconductor film 22 is removed by laser decontamination, only Cr can be selectively left unremoved by using laser light 24 of a proper wavelength. Since a chromium oxide forms a p-type semiconductor, only the p-type semiconductor film 21 remains on the surface of the metal base 2. An n-type semiconductor film, i.e., a catalyst film, is formed on the p-type semiconductor film 21. The n-type semiconductor film overlying the p-type semiconductor film 21 exercises a high corrosion potential reducing effect.